DOCUMENT RESUME

ED 331 951 CE 056 676

AUTHOR Oduaran, Akpovire
TITLE The Computer Revolution and Adult Education. Growth Prospects in Africa.
PUB DATE Apr 91
NOTE 27p.; Revised version of a paper presented at the Annual Meeting of the American Association for Adult and Continuing Education (Salt Lake City, UT, November 5, 1990).
PUB TYPE Speeches/Conference Papers (150) -- Viewpoints (Opinion/Position Papers, Essays, etc.) (120)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Adult Education; Computer Literacy; *Computer Oriented Programs; *Computer Uses in Education; *Developing Nations; Economic Development; *Educational Improvement; Educational Philosophy; *Foreign Countries; Problems
IDENTIFIERS *Africa

ABSTRACT

Most African countries are presently overburdened by their debts, declining economies, and quality of living as well as abiding struggles for the restoration of democracy. However, they have noted the global revolution in the development and application of computers. Most Africans believe that computers and intensive and relevant education for all provide opportunities for speeding up the development process. Although most education in African nations is directed at youths, computers could be applied to many aspects of African adult education, such as retaining students, providing information systems, retraining, computer literacy, distance education, and computer conferencing. Conversely, several problems could develop in the use of computers in adult education, such as computer-related crimes, policy setbacks, the presence of nontechnical administrators, an inadequate supply of personnel, an inadequate infrastructure, costs, technical issues, and suspicion of computers. Surmounting such problems requires concerted international cooperation in fostering the use of computers in Africa, training adults in computer use, and promoting adult education research. (20 references) (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED331951

THE COMPUTER REVOLUTION AND ADULT EDUCATION GROWTH PROSPECTS IN AFRICA*

BY

DR. AKPOVIRE ODUARAN
UNIVERSITY OF BENIN
BENIN CITY
NIGERIA

BEING AN ADAPTED VERSION OF THE TEXT OF A PAPER SENT IN TO THE 1990 AAACE INTERNATIONAL PROGRAMMES CONFERENCE HELD AT SALT LAKE CITY, UTAH, USA FROM OCTOBER 28 TO NOVEMBER 5, 1990

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

APRIL, 1991

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

A Oduaran

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CE 056676

BEST COPY AVAILABLE

A B S T R A C T

This discussion is based on the assumption that african adult education stands to gain from the integration of the computer technology. From its humble beginnings, the computer has acquired immense aura probably because of the enviable results it has mani- fested in the service industry. Such gains are certainly not applicable only to the traditional bases of computer usage and technology. Consequently, we have attempted to examine briefly the computer revolution in relation to the contexts in which it could be applied in african adult education to enhance more elaborate clientele participation in the programs. The discussion was brought to a close by highlighting contraints in the application of the computer to the growth process, the possible mitigations and the utility of international cooperation.

THE COMPUTER REVOLUTION AND ADULT EDUCATION

GROWTH PROSPECTS IN AFRICA

INTRODUCTION

Although most African countries are presently overtly overburdened by their suffocating debts, declining economies and quality of living as well as abiding struggles for the restoration of democracy in preference to military dictatorships and one-party regimes, they have not been unmindful of the global revolution in the development and application of the computer. Most africans believe the computer and, indeed, that intensive and relevant education of all provide opportunities for the speeding up of our development process.

Unfortunately, however, the vision of education for all in Africa focuses, for weal or for woe, on the initiation of viable policies for reaching out to just one-third of the target audience. This "lucky" target audience is made up of the young ones. The remaining two-third of the target audience made up largely of the adults are often left in the cold, occasionally attracting sympathetic but void top level government official comments. In line with that manifestation, discussions and actions on education for all adults, when at all remembered, focus on using the traditional methods. The modern systems of communication, with the computer at the core, are often ignored for no certain reasons. Yet, it is realised

that the traditional approaches alone hold very little attraction to the emergent african who is so encumbered with immense and diverse pressures.

Thus, the purposes of this presentation are:

1. to review briefly dimensions of the computer revolution;
2. to critically analyse the context of african adult education and aspects to which the computer could be applied;
3. to highlight constraints which could hinder african adult education computer application;
4. to propose some remedies; and
5. to examine areas of international co-operation in ensuring computer application on the continent.

GLOBAL DIMENSIONS OF THE COMPUTER REVOLUTION

The computer, a term commonly and narrowly used to refer to an "electronic" digital stored program relying on switches, wires and circuits through which electricity flows (Senn, 1978), ranks very easily as one of the most dynamics entries into scientific and technological development of our modern world. It is no gain-saying the obvious that without the computer we would probably not have arrived at this stage of development.

Since the entry of the computer into modern development efforts, it has experienced "dramatic" leaps in terms of popular applications, adaptations and costs reduction. Indeed,

developments in the aspects of hardware have been rather dramatic, even though this is not quite the case with softwares. Noted Sattar (1988):

> **A recent study shows that, since 1953 there has been a million time increase in performance/cost ratio of hardware. However, during the same period the cost of software has continued to escalate... an increase from 30% of the total cost in the 1950's to 85% in the 1980's.**

Despite this set-back, there is general expectation that the complete automation in both hardwares and softwares production should lead on to more widespread applications.

Of greater interest to us in our own context is how much effect the computer seems to have had on formal education (including non-formal education). The use of the computer for education probably began from the late 1970's. This was when education systems in the developed North introduced the computer, on a large scale, into the schools (Makau, 1988). By the year 1987 some of the countries in the developed North had made the computer more readily available with the advent of Micro-electronics which paved the way to the manufacture of what Makau (1988) describes as cheaper but smaller and more powerful computers. Consequently, an upsurge was recorded in the availability and use of micro-computers in Scotland,

Australia, Denmark, France, England and Wales, Iceland, Canada and the United States (Scottish Education Department and OECD, 1987, Sewell and Rotheray, 1987 and Hubert, 1988). Right now, the industry, public authorities, business circles, families, professionals and the media are at the forefront of ensuring that the computer is fully intergrated into learning systems. Today, computer application is almost cutting across all aspects of human activities ranging from the most sophisticated to the simplest pursuits.

AFRICAN DIMENSIONS OF THE COMPUTER REVOLUTION

Africa has not been untouched by the profound effects of the rapidly changing information technology with the computer as a focus in addition to interactive video and telecommunication devices. Unfortunately, however, only a few african countries have joined the ambitious and prestigious race for the widespread application of the computer. Perhaps, apart from Kenya, Tanzania, Egypt, Lybia, South Africa, Ghana, Zimbabue and Nigeria, one cannot be too sure that the computer has made profound entry into the business and service operations, of african countries. Generally, however, the computer is regarded as a powerful weapon for national development in several african countries. (Akinlade, 1986 and Oduaran, 1990).

Significant incursions have been noticed in the computerisation of africa's educational systems. As Makau

(1988) has rightly noted, the pressure for computerisation has come from outside the educational system, and this development mirrors also the trend in the developed North. Several african countries are only expressing interest in the rapid growth of the information technology. In Kenya, for example, there is now the awareness that:

> **Government policy will... continue to encourage the adoption of appropriate informa-tion technology and to facilitate its develop-ment and acquisition..(Republic of Kenya,1989)**

Government interest in information technology has not begun and ended with Kenya. We had noted elsewhere (Oduaran, 1990) that the computer technology which began in Nigeria in 1945 has since spanned Nigerian institutions of learning, hospitals, banks, law firms, oil industries, defence and multi-nationals. In fact, there is a professional body known as the Computer Association of Nigeria (CAN), inaugurated in 1980 and with membership of over 3,000 which has been working hard not only to enforce professional ethics but to join forces with the Computer Manufacturers and Vendors Association of Nigeria (CONVAN) and Computer Users Association of Nigeria (CUAN) in the steady drive to ensure the widespread application of the computer.

Africa is striving hard, barring all odds, to promote computer literacy and, more importantly, ensure the full integration of the computer into learning systems. This is being done in recognition of the fact that the computer provides avenue for the reformation of traditional curricula and instructional processes such that the teacher - dominated, drab and obsolete system wherein teachers toil with inadequate results to dish out factual knowledge as though they were all - knowing or infallable 'parrots' is completely uprooted. It is acknowledged in africa as in the developed North that the computer remains one of the surest guarantees for rejuvenating learning - centred processes which nurture confidence, intimacy, initiative, mental skills, problem-solving and reasoning skills as well as socio-psychological inter-action and, therefore, the development of a complete and self-propelling personality (Bork 1984, Becker, 1984, Makau 1988, Baron 1989 and Oduaran 1990). As a first step in ensuring the generally acknowledged objective of modernizing the educational system, Nigeria has taken a lead in initiating the process of computerising educational data across the country.

Impressive as the general strides are, one is want to find out how the gains being anticipated from the application of the computer could be transmitted to adult education on the continent. But a proper understanding could be better done from a brief examination of the context of african adult

education with a view to identifying the aspects of the computer that could be applied to it.

THE CONTEXT OF AFRICAN ADULT EDUCATION

African adult education has moved way from its traditional roots which emphasised apprenticeship and farming largely for men and home management for women (Omolewa, 1981). It has undergone

profound changes leading to modernisation of some kind. Many african countries have since engaged in efforts to make the wholly illiterate african adults literate. Making the large number of illiterate africans literate appears to be our first pre-occupation in african adult education, and the reasons are quite obvious. Africans are yet to be convinced by anybody that literacy is worthless or that it is not a pre-requisite for development, be it physical or non-physical.

Beyond the pursuit of literacy, several african countries are getting increasingly involved in the search for the inauguration of conscientization, community education, continuing education, distance education, women's education and retraining. This forum does not offer an opportunity for an assessment. We can say, however, that the laudable goals intended in the universalisation of education in Africa are yet to be fully achieved.

Many african scholars are increasingly getting bothered that the failure of the formal system of education is permeating the non-formal system. This position was confirmed by a 1985 UNESCO - sponsored study which was conducted by Carr-Hill and Lintott, and the results of which are presented in Table 1 below:

TABLE 1

ENROLMENT IN ADULT EDUCATION AS A PROPORTION OF THE ADULT POPULATION (15+) IN AFRICA

Country	Year	Adult Education Enrolment	Population 15 and over (1000s)**	No. of Adult Students per 1000 population 15 and over
Benin	1981	9719	1959.3	5
Botswana	1978	192	336.8	1
Burkina Faso (Q)	1981	58680	3934.0	13
Burundi (Q)	1981	6770	2523.3	3
Central African Republic	1977	1152	1241.1	1
Egypt (P)	1982	189088	26738.9	7
Guinea-Bissau	1981	14160	356.6	40
Liberia (P)	1980	14660	1023.8	14
Libya (P)	1974	94470	1259.9	75
Mozambique (Q)	1982	278561	6206.6	45
Nigeria	1979	201352	35859.2	6
Sierra Leone (P)	1980	11643	1949.5	6
Somalia (P)	1981	24815	2717.8	9
Sudan	1980	101336	10269.4	10
Swaziland	1978	2896	288.9	10
Tanzania (P)	1977	3567544	8904.3	401
Zambia	1980	19787	3052.0	7
Zimbabwe	1979	4065	3777.6	1

*As estimated by the United Nation (Assessment made in 1980)

Note: The symbol 'P' indicates that the data has come from a pilot study: the symbol 'Q' that the data is from the reply to the UNESCO Questionnaire.

**Figures given to nearest whole number for ease of comparison.

Sources: Carr-Hill and Lintott (1985).

As one can observe in Table 1 above, the index of participation in adult education programs is quite unimpressive. What this implies is that african countries are not yet discovering in both formal and non-formal education the anchor for the envisaged rapid national development. While the formal education system is dogged by pre-sumably anticipated upsurge in school enrolments, inadequate planning and, sometimes, poor implementation of policies, the non-formal system is palpably held down in half-hearted government commitment, defective policies, inadequate funding, largely untrained personnel and glaring low level of participation by the target population.

In uncertain situations such as the african countries have found themselves in it is not normal to anticipate some kind of remediation in the attractive information technology with the computer at its core of operations.

AFRICAN ADULT EDUCATION AND COMPUTER APPLICATION

There is widespread convinction in African countries that the computer is a reliable compendium in the drive for modernization. Indeed, the computer, even though its application is yet limited, is strongly believed to have its strong contribution to make to the resolution of a myraid of problems. One of such problems for adult education scholars, planners, administrators and providers (that is, funding agencies) is that of the low level of participation by the clients as earlier on pointed out.

In the largely unquestioned "love" for the computer very few african adult educators stop to find out exactly what aspects of african adult education really require computer application so as to stimulate the long awaited growth. This is an issue which remains at the centre of this discussion. In other words, we need to ask: which aspects of african adult education really require the application of the computer for a more rapid growth of the discipline?

First, we have to make one basic assumption. It is to be assumed that african political, economic and education leaders are about wholly convinced about the usefulness of the computer for development matters and policy formation. Unless this is the case, the proposals we are here submitting may just as well be

regarded as purely theoretical. Going by this assumption, we now proceed to examine the areas in african adult education that really require the application of the computer.

Internal Efficiency:-

Ordinarily, the concept of internal efficiency is used in management circles to refer to the ability of an organization to retain its key personnel on the hob. Internal efficiency is, however, being used in this discussion to refer to the ability of african adult education systems to retain mostly the clients or participants. One may want to ask why the emphasis on clients. The reason is obvious, clients participation is a strong indicator of the success or otherwise of the adult education programs that are provided.

We had alluded in the earlier sections of this presentation to a low level of participation. Perhaps, the clearest indicator of this low level of participation is the fact that of the 889 million adult illiterates which the UNESCO (1985) estimated to be inhabiting our world, 162 million or 18 per cent of them are in Africa, coming next only to Asia which had 666 million or 75 per cent of them. Many reasons are adduced for this claring evidence of our failure but none of these actually point at the management of programs as one strong reason. Program management is one part solution to the problem of low level of participation. In other words, the computer has an important and urgent role to play in securing the growth of

african adult education. This is a subject we had discussed elaborately elsewhere (Oduaran, 1990). In brief, the computer has the capability of enhancing the internal efficiency of our programs in such areas as the collection, storage, control processing and utilization and exchange of reliable data on african adult education. There is hardly and doubt an adult education system carefully planned and managed on the basis of the procurement of reliable data is a first and urgent requirement for establishing efficient programs that could attract a high level of participation.

Adult Education Information Systems:-

Closely tied to the problem of the low level of participation and internal efficiency is the issue of information systems. In spite of the rapid achievement in the developed North of the vision of a global village which Mcluhan had anticipated several decades ago. Africa painfully remains one continent in the world where that vision could not be said to have materialised to an appreciable extent. Consequently, the exchange of adult education information on a continental basis is many years or even decades away. This is made worst by the prevalence of close to four different major languages of official communication.

One side-effect of the relative lack of exchange of information on the continent is that experiences are hardly shared between and among african countries. It is easy to find

that a Nigerian professor of adult education may be quite ignorant of the pattern and status of the discipline in such countries as Niger, Chad, Benin and Camerouns with whom Nigeria shares borders. In a situation like this there is hardly any way african countries can support each other in terms of having strong continental system of adult education. Yet information exchange is vital to the survival of organisations, and indeed form a major component which informs decision makers at all levels about those variables which depict the state of the organisation and those which represent changes or rates of change in variables affecting the given organisation (Brookes et al. 1983). It is common knowledge too that most efficient information systems are computer based and speed up the rate of growth of given systems most of the time.

Retraining and Informations:

African formal systems of education have lately undergone reviews. It has been discovered that many graduates from the formal system of education have acquired "unwanted" skills in terms of labour market demands. It is an indication of a serious oversight, and the non-formal education system has taken on the task of "recycling" these wastages such that they could become useful. In Nigeria, for example, the National Directorate of Employment is addressing itself to the issue of retraining for the acquisition of usable skills.

It is envisaged that the massive retraining programs several african countries have either embarked upon or are contemplating could be enhanced by the computer. For one thing, retraining for computer skills acquisition has the potential for attracting clientele acceptability. As a matter of fact, the mounting of a program in informatics such as was the case for adults in Western Germany (Balzert and Hille, 1980) could attract a much larger audience than a program in general liberal studies. Unfortunately, there is no where in africa any adult education system has contemplated this challenging option yet.

Computer Literacy:-

The concept of computer literacy refers to programs directed at educating people about the uses of the computer, and beyond this, affording many adults the opportunity of using the computer themselves.

The computer is yet to record widespread usages in africa. The continent is very much in the threshold of computer illiteracy whether among the educated or uneducated and illiterate persons. Therefore, adult education programs directed at making good this situation are likely to stimulate widespread acceptance and partici-pation.

Distance Education and the Computer:-

Africa is experiencing, perhaps in response to global economic pressures, an era of the retraction in education. Apart from cuts in financial allocations to education in

preference for a rise in defence budgets, many young africans who are in hot pursuit of higher education are discovering, to their dismay, that available places cannot cope with the unprecedented demand. That, of course, has thrown the challenge to distance education.

In several african countries distance education is getting popular acceptance as one useful option. Unfortunately, there is much reliance on the use of correspondence. If and when communication is secured on the continent, distance education could get the boost it needs through computer application. At that point, for example, the IBM' byte - oriented line control known as Binery Synchronous Communications (BSC) which, according to Jarema and Sussenguth (1981), is a general - purpose data link control providing synchronous communications between a variety of terminals and transmission control units, could become attractive enough to support distance education programs on the continent. At that point african countries could contemplate experimentation with what Roger Boshier (1990) has described as "electronic universities". The picture could then become complete with the electronic mail (E-Mail) and networking. The realisation of that ambition which sounds utopic in the light of our present travails could be a steady step towards sharing expertise, knowledge and experience on the continent, and, thereby, the growth of african distance education programs.

Computer Conferencing:-

Even though there has not been any conscious attempt in this paper to address all the areas to which the computer could be applied in attempt to propagate the growth of african adult education, one clear area one must consider in this section is conferences. Many african countries are presently engaged in summoning all kinds of conferences to address different issues. Conferences provide opportunities for useful exchange and linkages, but these gains are experiencing contraction on the continent probably because of liquidity problems. In times like these computer conferencing could offer part-solution. For example, a conference of experts on african debts problems could be run on a model of computer conferencing such that experts in Kenya, Nigeria and South Africa could analyse the issues involved without being in physical contact. This is the heart of the AOLIN, the Synracuse ADEDNET and Global Systems Analysis and Stimulation (GLOSAS) projects reported upon by Roger Boshier (1990). Computer conferencing on the african continent has the potentiality of promoting participation in adult education programs for educated african professionals who are in search of current knowledge and skills in their areas of specialisation.

CONSTRAINTS AND REMEDIES

The gains anticipated in the application of the computer for the purpose of enhancing adult education could be elusive because of several constraints. We must summarise these thus:

1. Computer - related crimes;
2. Policy setbacks;
3. Presence of non-technical administrators;
4. Inadequate supply of manpower;
5. Inadequate infrastructures;
6. Costs;
7. Technical issues; and
8. Suspicion of the computer.

The computer can easily be abused through the feeding in of wrong data or distorted bits of information. This means that if our objective is fool-proof evidence we must have honest staff for all the gains anticipated to materialise.

Many african countries are yet to have definite and well-funded policies on the promotion of computer application, especially in adult education. Makau (1988) reported in his case-study that several well-placed africans are still in doubt as to whether the computerisation of education can really result in significant gains in learners' academic achievement. If such doubts still prevail even at the top, one can hardly be surprised by the dearth of concrete policies. Fortunately, many african leaders are realising the wisdom in the computer appeal, thanks to the computer related evidence of achievements in the developed North. African computer experts have to keep on trumpeting the gains.

The absence of clear policies is made worst by the preponderance of non-technical administrators among decision-makers. This category of people are almost always reluctant to accept the computer. They could be brought into the appreciation of the computer by the deliberate promotion of computer literacy.

The pursuit of computer literacy is capable of being circumscribed by the inadequate supply of manpower for computer programming, servicing and construction. Already, Nigeria and Kenya are pursuing enviable programs in computer literacy and computer technology. In Nigeria, for example, Oshunbiyi (1989) has reported on the efforts of some students at the Anambra State University, Enugu and a lecturer at the Federal University of Technology, Minna, to build their own computer. Such ambitious attempts ought to be widespread on the continent.

The availability of the computer for the promotion of adult education in africa could further be hindered by widespread inefficient infrastructures, especially electricity on which the computer relies. There is no doubt that africa has abundant sources of energy supply. These have not been fully developed. This means that the pursuit of the computer must be matched by significant improvements in energy supply.

Even if infrastructures were to be developed for effective computer application, the constraint of costs would remain. In an era of structural adjustment, it may look a luxurious and

expensive ambition to contemplate elaborate computer adaptation programs. What an american user, for example, would consider as a cheap computer may be beyond the reach of an african professor. So, where lies the hope for common and widespread application of the computer in african adult education programms. It seems obvious, therefore, that african countries must pursue with zest ways of cheaply producing the computer.

For the moment, the application of the computer is bogged down by a number of technical issues. To take just one of these, it is commonly acknowledged that different computer programs on the continent are experiencing problems in the servicing of equipment and even in the procurement of softwares and parts where the expertise is available. The fact is that the programs lie isolated from the source of the computer technology. This has to be re-dressed from the point of view of indigenising the technology against all known odds.

In a somewhat reflection of growing societies several people on the continent still believe that the computer has come to supplant and not support the user. This accounts for the negative disposition the promoters of the computer in africa are experiencing. This again means that we must embark on computer literarcy drives at all levels. The confidence of the people must be secured.

INTERNATIONAL CO-OPERATION

Surmounting the various problems which seem to make the goals of broadening the scope of participation in african adult education almost utopian requires concerted international co-operation. This isthe issue the remaining segment in this discussion must now address.

African countries in the forefront of indigensing computer technology can possibly teach the world lessons in improvisation and adaptation. It is true that the computer is not indegenous to Africa but small-scale projects in the area of producing cheaper and home-made computer technology are receiving attention. The results might be faster in coming with some support from the traditional developed Northern countries that are friendly to africa.

The large-scale success in the manufacture and application of the computer in countries like USA, Canada, England, France, Germany and Japan could be instructive to african countries. The provision of opportunities to african adult educators to undertake computer studies in such countries could go a long way in strengthening the base for the introduction of the computer into african adult education systems.

Finally, international co-operation is needed in the area of collaborative adult education computer-related research. A strong base for the application of the computer to the promotion of adult education could be provided if there is co-operation in

researches aimed at:

1. Costs reduction;
2. Equipment maintenance;
3. Psychological fears of users in developing or depressive environments; and
4. Popularising computer application.

There is considerable hope that the steady promotion of computer usages on the african continent could gain in momentum from its careful penetration of different aspects of the adult education system. This, of course, depends again on the goodwill and support of the people and friends of Africa.

REFERENCES

AKINLADE, T.O. (1986) "Computers as a tool for national development: Getting started", Information Technology for Development Vol.1, No. 3.

BELZERT, H. and HILLE, H. (1980): "A standardized curriculum in informatics for adult education", Computers and Education: And International Journal, Vol.4 pp.189-198.

BARON, G.L. (1984): "Computers in Education; The shape of things to come", Bulletin of the International Bureau of Education, No. 250, Paris: UNESCO.

BECKER, H.J. (1984): "Computers in Schools today: Some basic considerations" The American Journal of Education, Vol.18, No. 2.

BORK, A. (1984): "Computers and the future; Education" Computers and Education. Vol. 8, No. 1, pp. 1-4.

BOSHIER, R. (1990): "Socio-psychological factors in electronic networking", International Journal of Lifelong Education, Vol.9 No. 1, January - March, pp 49 -64.

BROOKES, C.H.P. et al (1983): "Information systems and the organisa-tion," Software World: An International Journal of Programs and Packages. Vol.14, No. 2, pp. 2-11.

CARR-HILL, R. and LINTOTT, J. (1985): Comparative Analysis of Statistical Data on Adult Education for 84 Count Countries. Paris: UNESCO Office of Statistics, p. 1 - 62.

HUBERT, N. (1988): The 1988 Computer in Education Survey - Class-room Computers Across Canada," Computers in Education: Canada's Computing Magazine for Education, Vol 5, No. 7, April, p. 15

JAREMA, D.R. and SUSSENGUTH, E.H. (1981): "IBM Data Communications: A quarter century of evolution and progress IBM Journal of Research and Development, Vol. 25, No.5, September pp.391 - 404.

MAKAU, B.M. (1988): Computers in Kenya's Secondary Schools: Case Study of an Innovation in Education. Ottawa; The International Development Research Centre, pp.1 - 9

ODUARAN, A. (1990): "Remediating the internal efficiency of adult education programmes in developing countries through computer application," International Journal of Computers In Adult Education and Training, pp. 37 - 47.

OMOLEWA, M. (1981): Adult Education Practice in Nigeria. Ibadan: Evans Brothers, pp 18 - 29.

OSHUNBIYI, O. (1989): "Computer usage for national development, Daily Champsion (Lagos), February 4, pp. 4 & 5.

REPUBLIC OF KENYA (1989): Development Plan, 1989 - 1993. Nairobi: Government Printer, pp 95 - 96.

SATTAR, A. (1988): "Computer Software and applications", Pakistan Journal of Distance Education, Vol.V. No. 1, pp 75 - 78.

SENN, J.A. (1978): Information System in Management. Belmont California; Wdsworth Pub. Co. Amc., pp 3 - 52.

SEWELL, D.F. and ROTHERSY, D.R. (1987): "The applications of computers in education", Prospects, Vol.17, No.3, p. 379.

SCOTTISH Education Department in Cooperation with OECD (1987): Implications for Teacher Education - Report of an International Seminar, Oct. p. 2.

UNESCO (1985): The Current Literacy Situation in the World. Paris: Unesco Division of Statistics on Education, p.3.